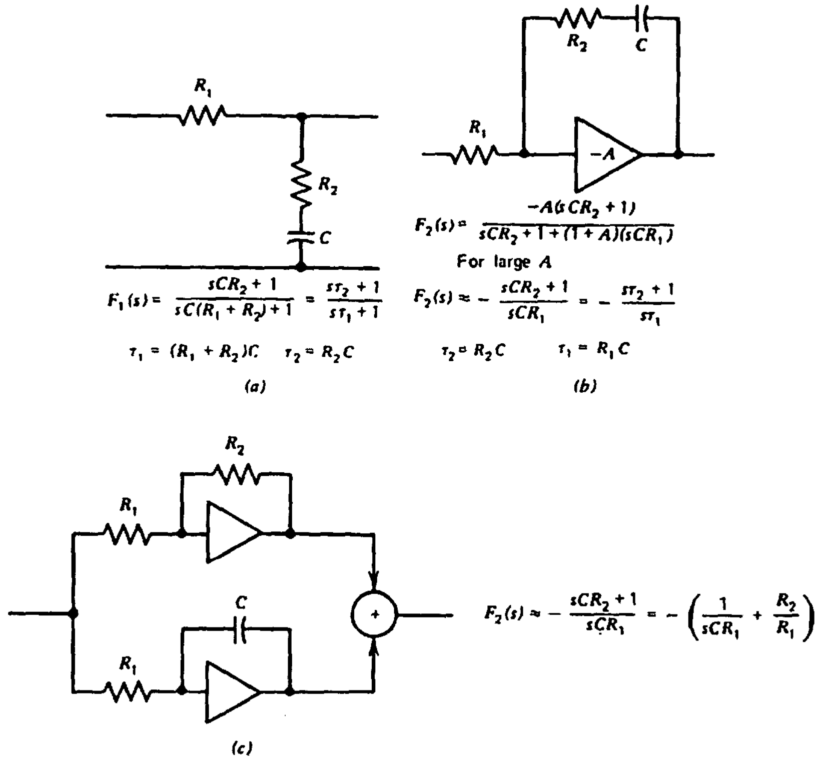

Figure 2.2 Filters used in second-order loop: (*a*) passive filter; (*b*) active filter; (*c*) alternative active filter. Both active filters have the same transfer function. The first active circuit is the one most often used, but the alternative form is sometimes more convenient.

satisfactory for many purposes. The active filter requires a high-gain DC amplifier but provides better tracking performance, as is shown in Chapter 4.

For the passive filter the closed-loop transfer function is

$$H_1(s) = \frac{K_o K_d (s\tau_2 + 1)/\tau_1}{s^2 + s(1 + K_o K_d \tau_2)/\tau_1 + K_o K_d/\tau_1} \tag{2.9}$$

For the active filter, after accommodating the phase reversal of the amplifier, the closed-loop transfer function is found to be

$$H_2(s) = \frac{K_o K_d (s\tau_2 + 1)/\tau_1}{s^2 + s(K_o K_d \tau_2/\tau_1) + K_o K_d/\tau_1} \tag{2.10}$$